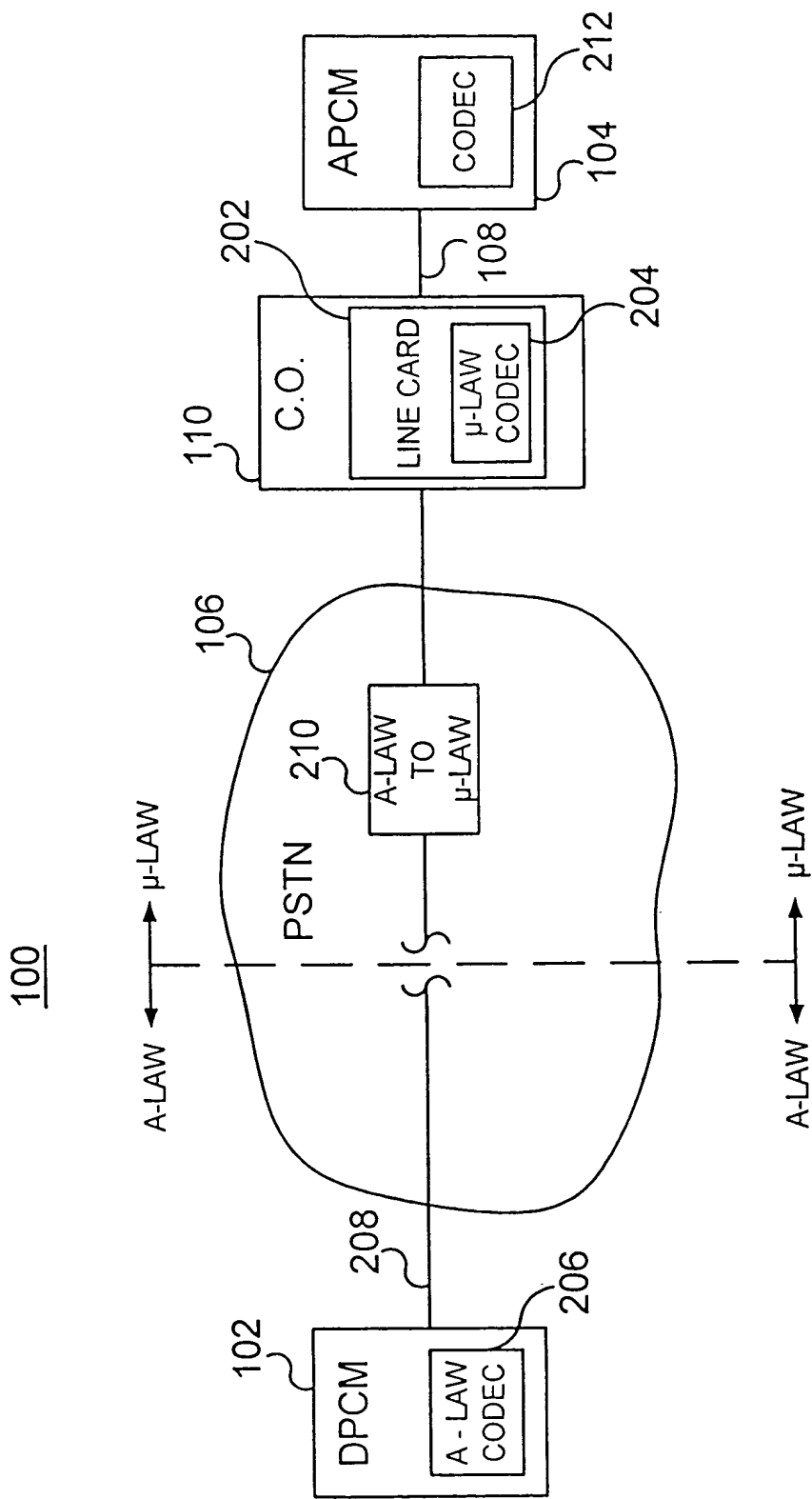
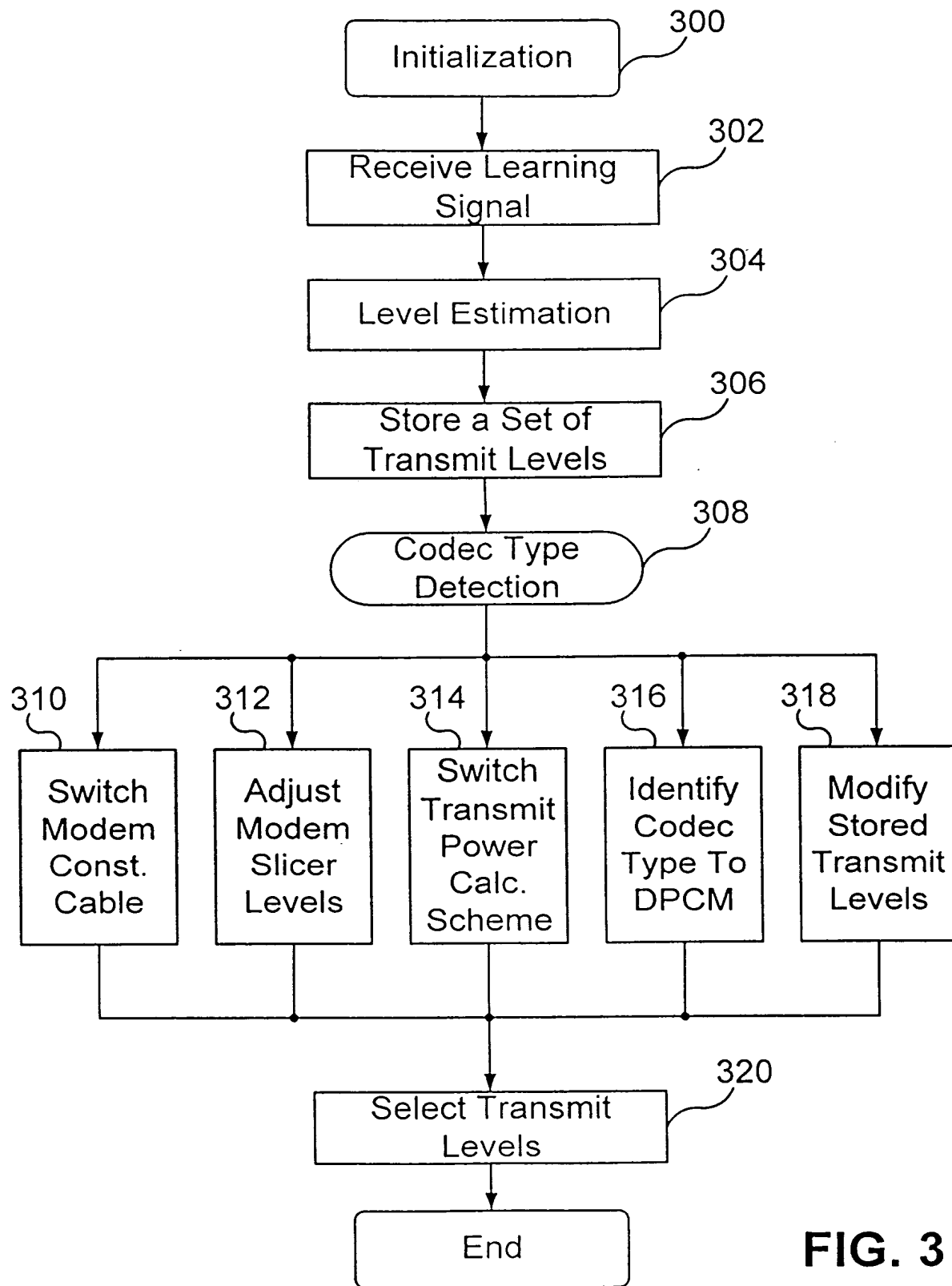


**FIG. 1**  
**(PRIOR ART)**



**FIG.2**  
**(PRIOR ART)**



**FIG. 3**

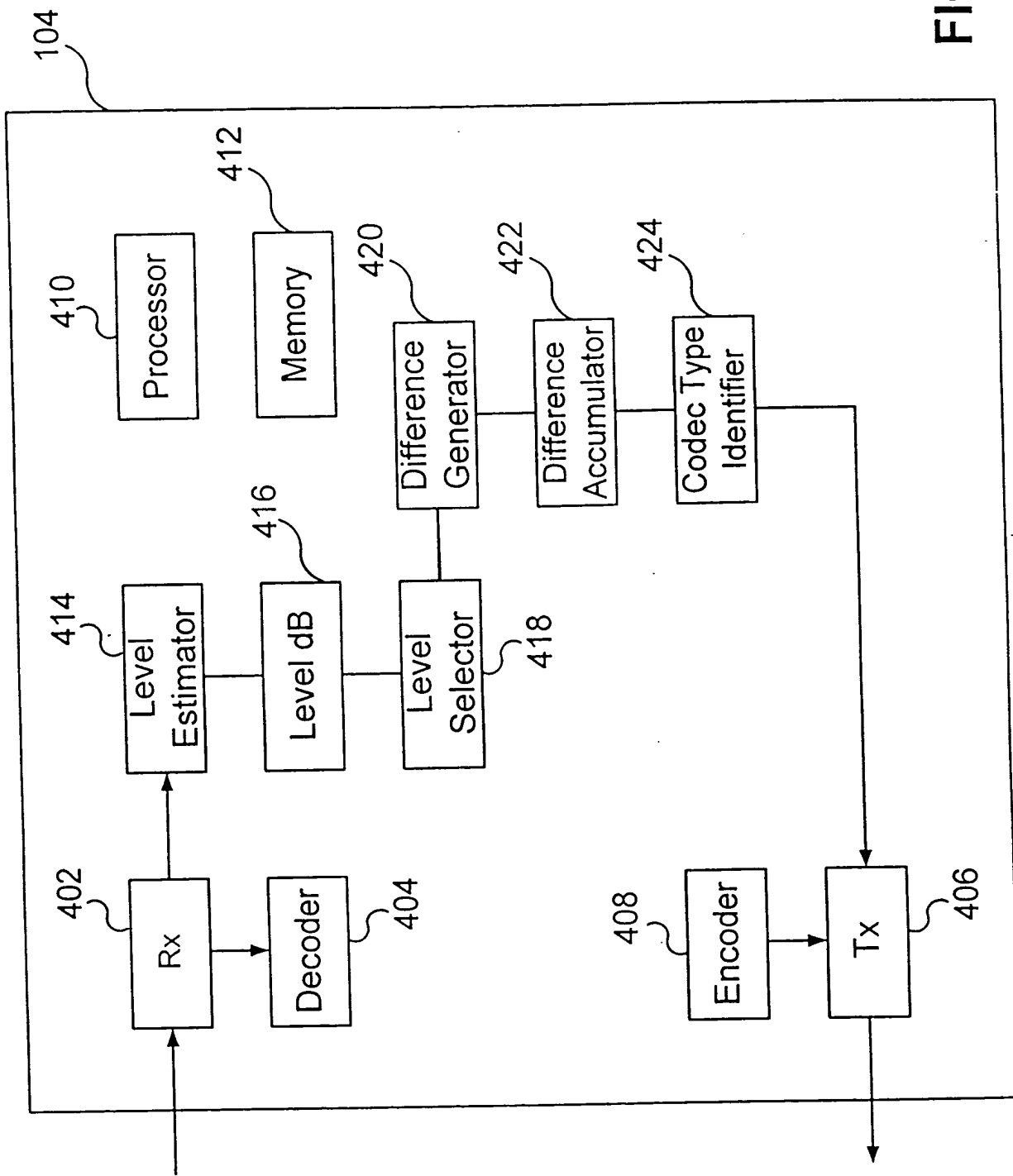
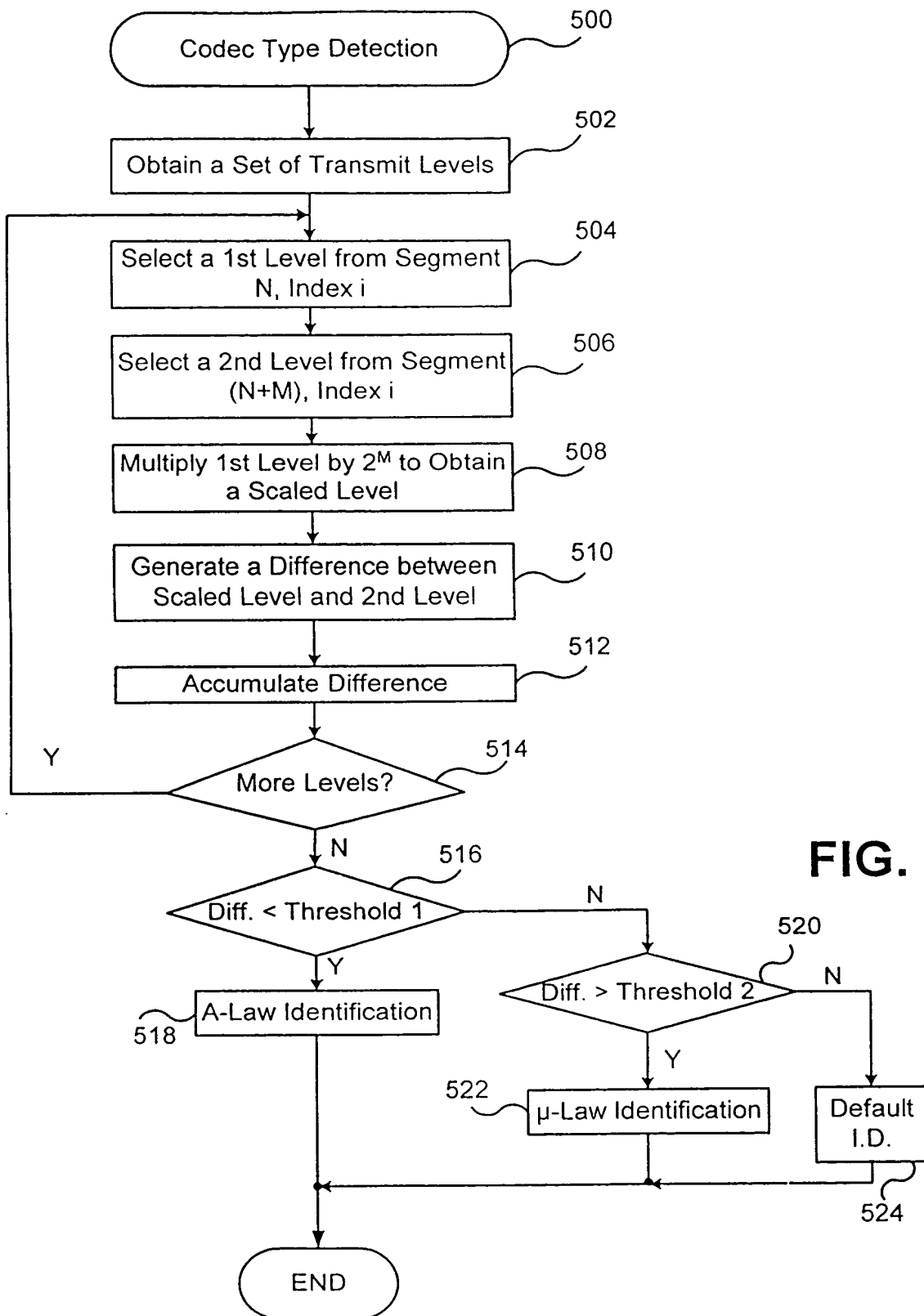


FIG. 4



**FIG. 5**

FIG. 6-1

The universal set of PCM codewords

| Ucode | $\mu$ -law PCM | $\mu$ -law linear | A-law PCM | A-law linear |
|-------|----------------|-------------------|-----------|--------------|
| 0     | FF             | 0                 | D5        | 8            |
| 1     | FE             | 8                 | D4        | 24           |
| 2     | FD             | 16                | D7        | 40           |
| 3     | FC             | 24                | D6        | 56           |
| 4     | FB             | 32                | D1        | 72           |
| 5     | FA             | 40                | D0        | 88           |
| 6     | F9             | 48                | D3        | 104          |
| 7     | F8             | 56                | D2        | 120          |
| 8     | F7             | 64                | DD        | 136          |
| 9     | F6             | 72                | DC        | 152          |
| 10    | F5             | 80                | DF        | 168          |
| 11    | F4             | 88                | DE        | 184          |
| 12    | F3             | 96                | D9        | 200          |
| 13    | F2             | 104               | D8        | 216          |
| 14    | F1             | 112               | DB        | 232          |
| 15    | F0             | 120               | DA        | 248          |
| 0     | EF             | 132               | C5        | 264          |
| 17    | EE             | 148               | C4        | 280          |
| 18    | ED             | 164               | C7        | 296          |
| 19    | EC             | 180               | C6        | 312          |
| 20    | EB             | 196               | C1        | 328          |
| 5     | EA             | 212               | C0        | 344          |
| 22    | E9             | 228               | C3        | 360          |
| 23    | E8             | 244               | C2        | 376          |
| 24    | E7             | 260               | CD        | 392          |
| 25    | E6             | 276               | CC        | 408          |
| 10    | E5             | 292               | CF        | 424          |
| 27    | E4             | 308               | CE        | 440          |
| 28    | E3             | 324               | C9        | 456          |
| 29    | E2             | 340               | C8        | 472          |
| 30    | E1             | 356               | CB        | 488          |
| 15    | E0             | 372               | CA        | 504          |
| 0     | DF             | 396               | F5        | 528          |
| 33    | DE             | 428               | F4        | 560          |
| 34    | DD             | 460               | F7        | 592          |
| 35    | DC             | 492               | F6        | 624          |
| 36    | DB             | 524               | F1        | 656          |
| 5     | DA             | 556               | F0        | 688          |
| 38    | D9             | 588               | F3        | 720          |
| 39    | D8             | 620               | F2        | 752          |
| 40    | D7             | 652               | FD        | 784          |
| 41    | D6             | 684               | FC        | 816          |
| 10    | D5             | 716               | FF        | 848          |
| 43    | D4             | 748               | FE        | 880          |
| 44    | D3             | 780               | F9        | 912          |
| 45    | D2             | 812               | F8        | 944          |
| 46    | D1             | 844               | FB        | 976          |
| 15    | D0             | 876               | FA        | 1008         |
| 0     | CF             | 924               | E5        | 1056         |
| 49    | CE             | 988               | E4        | 1120         |
| 50    | CD             | 1052              | E7        | 1184         |
| 51    | CC             | 1116              | E6        | 1248         |
| 52    | CB             | 1180              | E1        | 1312         |
| 5     | CA             | 1244              | E0        | 1376         |
| 54    | C9             | 1308              | E3        | 1440         |
| 55    | C8             | 1372              | E2        | 1504         |
| 56    | C7             | 1436              | ED        | 1568         |
| 57    | C6             | 1500              | EC        | 1632         |
| 10    | C5             | 1564              | EF        | 1696         |
| 59    | C4             | 1628              | EE        | 1760         |
| 60    | C3             | 1692              | E9        | 1824         |
| 61    | C2             | 1756              | E8        | 1888         |
| 62    | C1             | 1820              | EB        | 1952         |
| 15    | C0             | 1884              | EA        | 2016         |

The universal set of PCM codewords

| Ucode | $\mu$ -low PCM | $\mu$ -low linear | A-low PCM | A-low linear |    |
|-------|----------------|-------------------|-----------|--------------|----|
| 64    | BF             | 1980              | 95        | 2112         | 0  |
| 65    | BE             | 2108              | 94        | 2240         |    |
| 66    | BD             | 2236              | 97        | 2368         |    |
| 67    | BC             | 2364              | 96        | 2496         |    |
| 68    | BB             | 2492              | 91        | 2624         |    |
| 69    | BA             | 2620              | 90        | 2752         | 5  |
| 70    | B9             | 2748              | 93        | 2880         |    |
| 71    | B8             | 2876              | 92        | 3008         |    |
| 72    | B7             | 3004              | 9D        | 3136         |    |
| 73    | B6             | 3132              | 9C        | 3264         |    |
| 74    | B5             | 3260              | 9F        | 3392         | 10 |
| 75    | B4             | 3388              | 9E        | 3520         |    |
| 76    | B3             | 3516              | 99        | 3648         |    |
| 77    | B2             | 3644              | 98        | 3776         |    |
| 78    | B1             | 3772              | 9B        | 3904         |    |
| 79    | B0             | 3900              | 9A        | 4032         | 15 |
| 80    | AF             | 4092              | 85        | 4224         | 0  |
| 81    | AE             | 4348              | 84        | 4480         |    |
| 82    | AD             | 4604              | 87        | 4736         |    |
| 83    | AC             | 4860              | 86        | 4992         |    |
| 84    | AB             | 5116              | 81        | 5248         |    |
| 85    | AA             | 5372              | 80        | 5504         | 5  |
| 86    | A9             | 5628              | 83        | 5760         |    |
| 87    | A8             | 5884              | 82        | 6016         |    |
| 88    | A7             | 6140              | 8D        | 6272         |    |
| 89    | A6             | 6396              | 8C        | 6528         | 10 |
| 90    | A5             | 6652              | 8F        | 6784         |    |
| 91    | A4             | 6908              | 8E        | 7040         |    |
| 92    | A3             | 7164              | 89        | 7296         |    |
| 93    | A2             | 7420              | 88        | 7552         |    |
| 94    | A1             | 7676              | 8B        | 7808         | 15 |
| 95    | A0             | 7932              | 8A        | 8064         | 0  |
| 96    | 9F             | 8316              | B5        | 8448         |    |
| 97    | 9E             | 8828              | B4        | 8960         |    |
| 98    | 9D             | 9340              | B7        | 9472         |    |
| 99    | 9C             | 9852              | B6        | 9984         |    |
| 100   | 9B             | 10364             | B1        | 10496        | 5  |
| 101   | 9A             | 10876             | B0        | 11008        |    |
| 102   | 99             | 11388             | B3        | 11520        |    |
| 103   | 98             | 11900             | B2        | 12032        |    |
| 104   | 97             | 12412             | BD        | 12544        |    |
| 105   | 96             | 12924             | BC        | 13056        | 10 |
| 106   | 95             | 13436             | BF        | 13568        |    |
| 107   | 94             | 13948             | BE        | 14080        |    |
| 108   | 93             | 14460             | B9        | 14592        |    |
| 109   | 92             | 14972             | B8        | 15104        |    |
| 110   | 91             | 15484             | BB        | 15616        | 15 |
| 111   | 90             | 15996             | BA        | 16128        | 0  |
| 112   | 8F             | 16764             | A5        | 16896        |    |
| 113   | 8E             | 17788             | A4        | 17920        |    |
| 114   | 8D             | 18812             | A7        | 18944        |    |
| 115   | 8C             | 19836             | A6        | 19968        |    |
| 116   | 8B             | 20860             | A1        | 20992        | 5  |
| 117   | 8A             | 21884             | A0        | 22016        |    |
| 118   | 89             | 22908             | A3        | 23040        |    |
| 119   | 88             | 23932             | A2        | 24064        |    |
| 120   | 87             | 24956             | AD        | 25088        |    |
| 121   | 86             | 25980             | AC        | 26112        | 10 |
| 122   | 85             | 27004             | AF        | 27136        |    |
| 123   | 84             | 28028             | AE        | 28160        |    |
| 124   | 83             | 29052             | A9        | 29184        |    |
| 125   | 82             | 30076             | A8        | 30208        | 15 |
| 126   | 81             | 31100             | AB        | 31232        |    |
| 127   | 80             | 32124             | AA        | 32256        |    |

FIG. 6-2

A-low, positive input values

| 1              | 2                                   | 3                           | 4                         | 5                                 | 6   | 7   | 8                           |
|----------------|-------------------------------------|-----------------------------|---------------------------|-----------------------------------|---|---|-----------------------------|
| Segment number | Number of intervals x interval size | Value at segment end points | Decision value number $n$ | Decision value $x_n$ (see Note 1) | Character signal before inversion of the even bits<br>Bit number<br>1 2 3 4 5 6 7 8 | Quantized value (value at decoder output) $y_n$ | Decoder output value number |
|                |                                     | 4096                        | (128)                     | (4096)                            | -----   |   |                             |
| 7              | 16 x 128                            |                             | 127                       | 3968                              | 1 1 1 1 1 1 1 1   | 4032  | 128                         |
|                |                                     |                             | 113                       | 2176                              | (see Note 2)  |   |                             |
|                |                                     | 2048                        | 112                       | 2048                              | 1 1 1 1 0 0 0 0   | 2112  | 113                         |
| 6              | 16 x 64                             |                             | 97                        | 1088                              | (see Note 2)  |   |                             |
|                |                                     | 1024                        | 96                        | 1024                              | 1 1 1 0 0 0 0 0   | 1056  | 97                          |
| 5              | 16 x 32                             |                             | 81                        | 544                               | (see Note 2)  |   |                             |
|                |                                     | 512                         | 80                        | 512                               | 1 1 0 1 0 0 0 0   | 528   | 81                          |
| 4              | 16 x 16                             |                             | 65                        | 272                               | (see Note 2)  |   |                             |
|                |                                     | 256                         | 64                        | 256                               | 1 1 0 0 0 0 0 0   | 264   | 65                          |
| 3              | 16 x 8                              |                             | 49                        | 136                               | (see Note 2)  |   |                             |
|                |                                     | 128                         | 48                        | 128                               | 1 0 1 1 0 0 0 0   | 132   | 49                          |
| 2              | 16 x 4                              |                             | 33                        | 68                                | (see Note 2)  |   |                             |
|                |                                     | 64                          | 32                        | 64                                | 1 0 1 0 0 0 0 0   | 66  | 33                          |
| 1              | 32 x 2                              |                             | 1                         | 2                                 | (see Note 2)  |   |                             |
|                |                                     |                             | 0                         | 0                                 | 1 0 0 0 0 0 0 0   | 1   | 1                           |

FIG. 7

FIG. 8

 $\mu$ -A conversion

| $\mu$ -law<br>Decoder output<br>value number | A-law<br>Decoder output<br>value number | $\mu$ -law<br>Decoder output<br>value number | A-law<br>Decoder output<br>value number |
|--|---|--|---|
| 0  | 1                                       | 44   | 41                                      |
| 1  | 1                                       | 45   | 42                                      |
| 2  | 2                                       | 46   | 43                                      |
| 3  | 2                                       | 47   | 44                                      |
| 4  | 3                                       | 48   | 46                                      |
| 5  | 3                                       | 49   | 48                                      |
| 6  | 4                                       | 50   | 49                                      |
| 7  | 4                                       | 51   | 50                                      |
| 8  | 5                                       | 52   | 51                                      |
| 9  | 5                                       | 53   | 52                                      |
| 10   | 6                                       | 54   | 53                                      |
| 11   | 6                                       | 55   | 54                                      |
| 12   | 7                                       | 56   | 55                                      |
| 13   | 7                                       | 57   | 56                                      |
| 14   | 8                                       | 58   | 57                                      |
| 15   | 8                                       | 59   | 58                                      |
| 16   | 9                                       | 60   | 59                                      |
| 17   | 10                                      | 61   | 60                                      |
| 18   | 11                                      | 62   | 61                                      |
| 19   | 12                                      | 63   | 62                                      |
| 20   | 13                                      | 64   | 64                                      |
| 21   | 14                                      | 65   | 65                                      |
| 22   | 15                                      | 66   | 66                                      |
| 23   | 16                                      | 67   | 67                                      |
| 24   | 17                                      | 68   | 68                                      |
| 25   | 18                                      | 69   | 69                                      |
| 26   | 19                                      | 70   | 70                                      |
| 27   | 20                                      | 71   | 71                                      |
| 28   | 21                                      | 72   | 72                                      |
| 29   | 22                                      | 73   | 73                                      |
| 30   | 23                                      | 74   | 74                                      |
| 31   | 24                                      | 75   | 75                                      |
| 32   | 25                                      | 76   | 76                                      |
| 33   | 27                                      | 77   | 77                                      |
| 34   | 29                                      | 78   | 78                                      |
| 35   | 31                                      | 79   | 79                                      |
| 36   | 33                                      | 80   | 81                                      |
| 37   | 34                                      | 81   | 82                                      |
| 38   | 35                                      | 82   | 83                                      |
| 39   | 36                                      | 83   | 84                                      |
| 40   | 37                                      | 84   | 85                                      |
| 41   | 38                                      | 85   | 86                                      |
| 42   | 39                                      | 86   | 87                                      |
| 43   | 40                                      | 87   | 88                                      |
|  |   | .  | .                                       |
|  |   | .  | .                                       |
|  |   | .  | .                                       |
|  |   | 127  | 128                                     |